

VGA Video Array

User's Manual

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Super probe

Tseng ET 4000
1K

Sierra SC1148 {2,3,4} 15 bit

or

SC1148 {5,7,9} 15/16 bit H Gber

Trim function in LotusScript

Removes leading and trailing spaces from a string and returns the resulting string.

Syntax

Trim[\$] (*stringExpr*)

Elements

stringExpr

Any string expression.

Return value

Trim returns the trimmed version of *stringExpr*, but does not modify the contents of *stringExpr* itself.

Trim returns a Variant of DataType 8 (String), and Trim\$ returns a String.

■ [See examples](#)

See related topics

[LSet statement in LotusScript](#)

[LTrim function in LotusScript](#)

[RSet statement in LotusScript](#)

[RTrim function in LotusScript](#)

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Shielded Cable Warning

"SHIELD INTERFERENCE CABLE(S) MUST BE USED ACCORDING TO FCC 15.838D."

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio/TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

CAUTION Changes or modifications not expressly approved by the Manufacturer could void your authority to operate this equipment in accordance with FCC rules and regulations.

SECTION 1: INTRODUCTION

This User's Manual is designed to answer questions you might have concerning the installation and use of the VGA Video Array. Please take the time to read through this document before installing your VGA Video Array.

1.1 Product Description

Congratulations on your purchase of the InSync Technologies, Inc. **VGA Video Array**. You now own a state-of-the-art, full-color VGA graphics board with features beyond any other in the VGA class.

These features include:

Multiple Board Capability allowing for up to twelve (12) VGA Video Array boards in a single PC for simultaneous control of multiple VGA and video output channels.

NTSC or PAL output video capability.

Flicker Reduction Filter on the output video channel. The patented flicker filter can be controlled by application software and used to improve the appearance of fine line graphics on a television monitor.

Optional Studio Gen-Lock feature which allows the video output to be synchronized to an external sync source as well as allowing H-Phase and Subcarrier adjustment.

VGA Compatibility. The board is register- and BIOS-level compatible with the IBM VGA Adapter.

High Quality Video Output Channel for recording or television display.

Full Analog Monitor Support and Extended Graphics Resolution Modes providing 640x480, 800x600 and 1024x768 high resolution on multi-frequency analog monitors such as the Mitsubishi Diamond Scan, NEC MultiSync, Sony Multiscan, and others. The 1024x768 mode is supported by the IBM 8514 and compatible monitors. Similar maximum resolutions can also be achieved with fixed-frequency analog monitors such as the IBM 85xx series.

VESA Compatibility. The VGA Video Array supports the VESA Super VGA BIOS extension Version 1.2.

Simultaneous Output of VGA, S-Video, composite and component (RGB) video.

Analog Output Connectors for composite/component video analog monitors (9-pin) and VGA analog monitors (15-pin).

Software Mode Controls which allow the selection of different display modes without resetting jumpers or switches.

15- and 16-Bit Color Support (with appropriate hardware configuration) producing up to 800x600 resolution with 32,768 and 65,536 simultaneously displayed colors.

Extended Text Modes providing 132x25, 132x28, 132x44, 100x40 and 80x60 resolutions which let your microcomputer, using popular emulator and micro/mainframe link products, emulate the display characteristics of widely used terminals such as the DEC VT100 and the IBM 3278 MOD 5.

Extended Text Drivers for Lotus 1-2-3 and Symphony.

Extended Graphics Drivers for Autodesk AutoCAD, Digital Research GEM, Microsoft® Windows™, WordPerfect, and Ventura Publisher.

Font Editor and Font Loader Software which lets you design and use custom character sets. These are ideal for scientific and foreign language applications.

1.2 Inventory Checklist

Before you begin installing your VGA Video Array, be sure that you have all of the following items:

- ☐ The VGA Video Array board
- ☐ (1) Utility Diskette and (2) VGA Driver Software Diskettes
- ☐ An RCA-to-RCA male-male composite video cable.

If any of the above items are missing from your package, please contact your place of purchase. Save all of your packing materials and your sales receipt to prevent damage to the board in case you need to ship it, and to maintain your warranty, respectively.

1.3 System Requirements

In order to use the VGA Video Array, your computer will need to meet the following requirements:

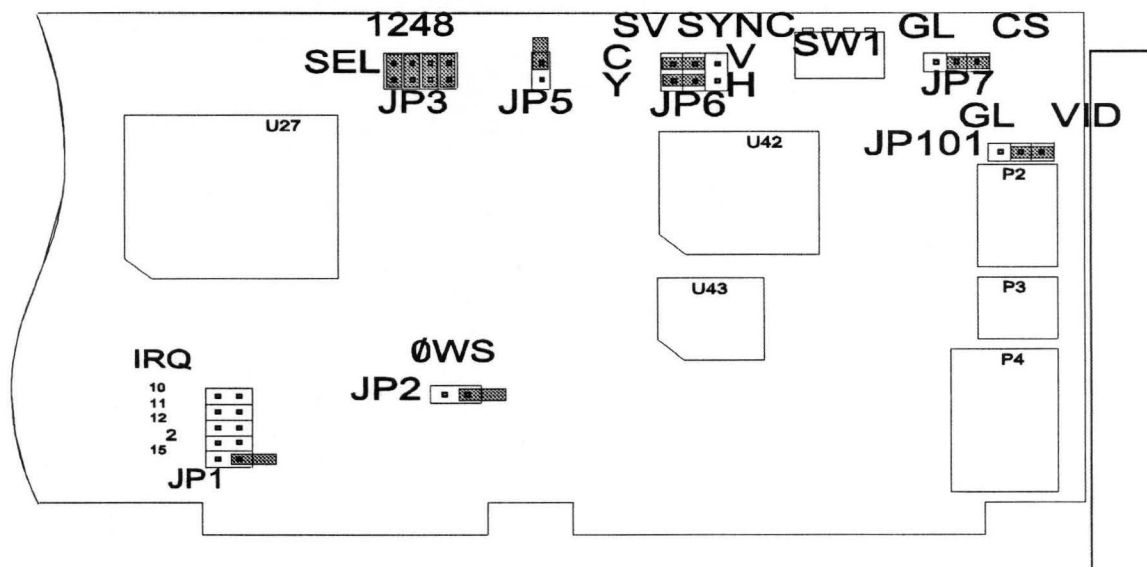
- A full-length AT 16-bit expansion slot available for each VGA Video Array board in an IBM PC AT or compatible.
- DOS/WINDOWS or OS/2 environment.
- A standard analog multifrequency or IBM PS/2 monitor.

IMPORTANT The VGA Video Array board uses the same 15-pin (DB15) cable standard used by monitor manufacturers to interface with IBM PS/2 computers. Using an incorrect cable configuration may result in damage to the monitor and/or adapter.

SECTION 2: INSTALLATION

2.1 Board Layout

The layout below will help you find components on your VGA Video Array board:



VGA Video Array Board Outline

2.2 Default Settings

The default settings on the VGA Video Array are as follows:

- Analog (15-pin) VGA monitor running 38kHz for 640x480 and 800x600 modes and 35.50kHz for 1024x768 modes
- Auto RAM bus width detection enabled
- 9-pin connector (P2) configured for S-Video output (Y and C out, TTL sync on Pin 7), with sync on R, G, and B disabled
- Vertical IRQ not selected (must install JP1 to select for your specific application)
- RCA connector (P3) configured for composite video out. Must configure JP101 for GL sync signal in if needed.

If you wish to keep the default settings, skip to Section 2.4.

2.3 Setting Jumpers and Switches

Jumper JP1 - Vertical Sync Interrupt Select

Normally, this interrupt is not used. In order to facilitate the use of the vertical sync interrupt in advanced OEM applications and to avoid possible conflicts with other installed hardware, this jumper can be set to select IRQ 2, 10, 11, 12 or 15.

Default = JP1 not installed.

Jumper JP2 - Zero Wait-State Select

When the VGA Video Array is configured to allow 16-bit bus accesses to its display memory, installing JP2 allows writes to display memory to occur with zero wait-states. This jumper has no effect during display memory reads or when the board is configured for 8-bit bus accesses.

Default = JP2 not installed.

Jumper JP3 - Board Select

This jumper selects which one of twelve Board Select Indices [0..11] this board will respond to. The current Board Select Index is written to the Board Select Register, bits d0-d3, on power up. Each board in a system must have a unique Board Select Index, and one Board Select Index must be zero (0). For all jumper positions, "Jumper Installed" equals a value of 0 for the corresponding bit

Default = JP3:1,2,4,8 installed (Board Select Index = 0).

Jumper JP4 - Not Used

Jumper JP5 - Sync on Red, Green, Blue

When enabled, this jumper causes the composite sync to be added to the red, green, and blue outputs.

Default = JP5 not installed (sync on R, G, and B disabled)

Jumper JP6 - S-Video/Sync Select

Pins 8 and 9 of the 9-pin D video connector can be configured for either S-Video outputs Y and C or for H- and V-sync drive outputs.

Default = JP6 configured for S-Video Y and C (conforms to TARGA configuration with S-Video out).

Jumper JP7 - Gen-Lock or Composite Sync

Pin 7 of the 9-pin D video connector can be configured for either composite sync output or for gen-lock black burst in.

Default = JP7 configured for composite sync out.

Jumper JP101 - RCA Jack Video Out or Gen-Lock In

The RCA jack (P3) can carry either the composite video output signal or the gen-lock black burst in.

Default = JP101 configured for composite video out.

Switch SW1 - Memory, Flicker Filter, and Video Configuration:

SW1-1: Controls the BIOS ROM configuration.

ON = BIOS ROM is configured as 16-bit.

OFF = BIOS ROM is configured as 8-bit.

Default is ON.

SW1-2: Controls the power-up display memory configuration.

ON = Display memory is configured as 16-bit, unless the memory test indicates a conflict.

OFF = Display memory is configured as 8-bit.

Default is ON.

SW1-3: Controls the power-up default for the patented Flicker Filter.

ON = Flicker Filter on at power-up.

OFF = Flicker Filter off at power-up.

Default is ON.

SW1-4: Controls the enabling or disabling of television video output on power up (NTSC or PAL depending on model of board). Note: video can be enabled and disabled under software control regardless of the position of this switch at power up.

ON = Video output enabled.

OFF = Video output disabled.

Default is ON.

2.4 Installing the VGA Video Array

IMPORTANT Consult the user's manuals for your base computer, your add-on boards and your peripherals as you perform the following steps.

1. Power OFF your computer system and any peripherals (display, printer, storage devices, modem, etc.)
2. Disconnect from the computer the AC line (power) cord and any cables which will interfere with removal of the cover.
3. Remove the cover from your computer. If you need specific instructions on how to do this please refer to your computer's user's manual.
4. Install your VGA Video Array board into any unused, full-length **16-bit** slot on the motherboard.
5. Make sure the VGA Video Array is fully seated in its 16-bit expansion slot. It and all other boards on the bus should fit snugly in their slots.
6. If you are installing the VGA Video Array in a system configured for an MDA or Hercules monochrome display, you may need to change the monitor type selection jumper or switch on your motherboard. Please consult your system's user's manual.
7. Replace the computer system cover and re-connect peripheral interface cables.
8. The next section, **2.5 Video Connections**, will assist you in connecting your video equipment to the VGA Video Array.
9. Once you have completed your video connections, reconnect the power cord to the computer and turn the computer on. If you need to make any adjustments to jumpers after this point, be sure to power your system off before doing so.

2.5 Video Connections

Before following the procedures to connect your monitor, complete the following:

- If you are using a multifrequency monitor, set it to analog input.
- Double check that you have the appropriate cable for your monitor.
- Refer to Appendix A and your monitor's documentation for connection details.

To connect your monitor to the VGA Video Array:

Analog VGA

Attach the monitor cable to the 15-pin connector on the VGA Video Array.

Composite Video

Attach the RCA connector (P/N ITI-098-02) to your video monitor and to the RCA jack on the VGA Video Array. Alternately, connect the composite video BNC connector of the 9-pin to five BNC cable (P/N ITI-098-04) to your monitor and the 9-pin D-connector to the matching connector on the VVA (P2).

Component Video

Attach the 9-pin cable connector (cable part # ITI-098-04) to the 9-pin connector (P2) on the VGA Video Array and attach the four BNC connectors (R, G, B, SYNC) to your video monitor.

S-Video

Attach the 4-pin DIN connector to your monitor and the 9-pin cable connector (cable part # ITI-098-03) to the 9-pin connector (P2) on the VGA Video Array. **Be sure that jumper JP6 is set to enable S-Video output.**

Note: If you will be using a custom cable, make sure that it is compatible with the VGA Video Array and with your monitor. Refer to *Appendix A: Connector Information*, for connector pinout definitions.

SECTION 3: SOFTWARE

The program diskettes included with your VGA Video Array board include demonstration software, utilities, font tools, and display drivers.

Full descriptions of the font tools, drivers, and demonstration software are contained in the files SOFTWARE.DOC and DEMO.DOC. These files are found on the diskettes provided with your board. Please refer to the file README.DOC contained on your floppies for any new information or changes made after publication of this document.

3.1 Installing the Software

To install your VGA Video Array utility software, copy the VGA Video Array diskettes onto your PC- or MS-DOS diskette or fixed disk drive:

Please remember to back up your VGA Video Array Diskettes before using them. Refer to your DOS Manual if necessary as you follow these steps to install your VGA Video Array software.

1. Boot the system if not already booted.
2. Create a VVARRAY directory in which to store utilities and drivers.
3. Copy the utility and driver files from the supplied diskettes into your VVARRAY directory.
4. Add your VVARRAY directory to your AUTOEXEC.BAT's PATH statement, if desired. This is required if you want to use VMODE or other ITI utilities from any directory on your computer.
5. Alternatively, you can copy the utilities you want to use to the directory in which you usually store utilities or any other directory in your path.

3.2 Software Summary

DISK 1, Utilities and Documentation:

EANSI.SYS

Extended ANSI driver for extended mode control.

VMODE.COM

InSync Technologies' VGA mode control software.

VVACONF.EXE

Polls VVArrays in system and reports NTSC/PAL, display memory configuration (8/16) and population (0.5M/1.0M), BIOS configuration (8/16), Video ON/OFF, Flicker Filter ON/OFF, and underscan ON/OFF.

VVARRAY.EXE

Detects number of VVArrays in system and then runs simple multi-board demonstration.

VVASEL.COM

Selects the active VVA from the command line in multi-board applications.

VVAVESA.COM

InSync Technologies' extended VESA and VVArray BIOS-call TSR.

SOFTWARE.DOC

Documentation for utilities and drivers.

FASTBIOS.SYS

BIOS speed utility for 286/386 machines.

FONTs

FONT.DOC	Font tools documentation.
FLOAD.COM	Font loader.
FEDIT.COM	Font editor.
FEDIT.HLP	Help for font editor.
6X8.FNT	Sample fonts.
8X8.FNT	
8X8THIN.FNT	
6X14.FNT	
8X14.FNT	
8X14APL.FNT	
8X14THIN.FNT	

8514EM

README.DOC	8514 emulator documentation.
RIXAI4.EXE	
RIXAI8.EXE	
STAN0715.FNT	
STAN0814.FNT	
STAN1220.FNT	

DISK 2, Windows 3.1 Drivers:

README.DOC Tseng Labs Windows 3.1 documentation.

*.FON Fontset for Windows 3.1 operation.

*.DRV Tseng Labs VGA drivers for Windows 3.1.

OEMSETUP.INF OEM Windows information file for Tseng Labs drivers, etc.

V7VGA.3GR

VGACOLRX.GR2

VDDTLI4.386

VGALOGO.LGO

VGALOGO.RLE

DISK 3, Drivers:

ADI Autodesk ADI drivers.

VINST.EXE ADI driver configure sw

VADI40.EXE ADI driver

GEM Gem drivers.

GEMSETUP.V31

LOTUS Lotus 1-2-3 drivers.

SIBM025.DRV

SIBM028.DRV

SIBM044.DRV

SIBM060.DRV

SIBM080.DRV

SIBM0FLY.DRV

VENTURA Ventura Publisher drivers.

SD1024.SYS

SD1024.VGA

SD800.SYS

SD800.VGA

VP2_0.TXT

VPDRV2_0.EXE

WORDSTAR Wordstar drivers.

TLIVGA6.WGD

TLIVGA7.WGD

WORDSTAR.DOC

PREVIEW.MSG

PREVIEW.OVR

WP WordPerfect 5.1 drivers.

WORDPERF.DOC

WP1024.WPD

WP51ET4.VRS

WP800.WPD

3.3 Utility Software Descriptions:

3.3.1 VMODE.COM

The **VMODE** command allows the user to select display modes and to control the special features of the VGA Video Array. Following are descriptions of the VMODE command options. VMODE is invoked by typing VMODE [option] <CR> where the option comes from the following list.

MDA	0	21	200	TELL	
VGA	1	22	350	VON	
MONO 2	23	400	VOFF		
COLOR 3	24	35K	FON		
HERCULES		4	25	38K	FOFF
40X25 / 40		5	26	48K	UON
80X25 / 80		6	29	45M	UOFF
80X43 / 43		7	2A	65M	FNORM
80X50 / 50		D	2D	60Hz	FLOW
80X60 / 60		E	2E	72Hz	INSTALL
132X25 / 25		F	2F		
132X28 / 28		10	30		
132X44 / 44		11	37		
132X60 12	38				
100X40 / 100	13	3D			

VMODE ? or VMODE HELP will list the options available, as in the list above. No choices can be made from this list directly but must be entered at the command line. Not all modes displayed are supported by all monitors. VMODE will alert you if you select an illegal mode.

VMODE TELL will display VMODE's current configuration.

The first time VMODE is accessed, you will be prompted to run **VMODE INSTALL**. The INSTALL process stores the configuration information within itself and acts appropriately to allow valid modes to be selected according to the monitor attached to the VGA Video Array. VMODE INSTALL does not need to be run again unless a different monitor is interfaced with the VGA Video Array.

Once VMODE INSTALL has been run, running VMODE with no parameter will list text modes from which to choose. By moving the cursor keys up or down to the desired selection and pressing Return, the text mode selected will be implemented. The monitor currently configured for is noted in the upper left corner of the display.

NOTE *Always be sure to choose modes or resolutions that are compatible with your video*

board configuration and monitor capabilities.

Using the Compatibility Modes

Some programs are written to be run using specific modes or are written according to particular video standards. For example, there are programs that require a monochrome adapter or those that are written exclusively for a Color Graphics Adapter. When these kinds of programs are used, it becomes necessary to make your VGA Video Array board appear to be what the program requires. This is easily accomplished. In order to select a mode that will change the "appearance" of the video adapter to the software, you need only select the appropriate VMODE parameter. When another mode is needed or desired, you can simply select the mode using another VMODE parameter. In order to return to the default mode (VGA), type VMODE VGA or power down (the VGA mode will be in effect upon power-up). The following is a list of modes and their uses. A complete listing of available modes can be seen by typing VMODE ?.

VMODE MDA Switches to a Monochrome Display Adapter if installed

VMODE VGA Sets for compatibility with the Video Graphics Array

VMODE MONO Monochrome mode

VMODE COLOR Color mode

VMODE HERCULES Switches to a Hercules card if installed

VMODE [#] Enter a Mode # from the list in Appendix C

VMODE Scan Lines Selection

The 200, 350, 400 modes are provided to enable you to change the scan line resolution. This feature allows you to accommodate software which specifically looks for a particular number of scan lines. The 400 scan line mode provides the most pleasing text resolution.

VMODE 200 to provide 200 scan lines in 40- or 80x25 text modes.

VMODE 350 to provide 350 scan lines in 40- or 80x25 text modes.

VMODE 400 to provide 400 scan lines in 40- or 80x25 text modes.

VMODE Scan Rates

There are VMODE options which may improve synchronization with a variety of monitors. Normally, the default scan rates are effective, but some monitors may require different scan rates for the most satisfactory display results. By setting these modes, frequencies are adjusted which affect displayed graphic modes. The following options are available via the VMODE command:

VMODE Option	Modes	Horiz. Freq.	Vert. Freq.	Resolution
35K	29,2A,30	35kHz	56Hz	800x600
38K	29,2A,30	38kHz	60Hz	800x600
48K	29,30	48.4kHz	72.7Hz	800x600
45M	37i,38i*	35.5kHz	86.5Hz	1024x768i
65M	37n,38n*	49kHz	60.5Hz	1024x768n

i interlaced

n non-interlaced

* requires 1Mb of memory

65MHz Modes

The graphic (not text) modes, 37 and 38 listed above, can be displayed after setting the video clock speed to 65MHz. The 65MHz mode will provide a clearer display with less flicker on some monitors. Set the VMODE parameter to **VMODE 65M**. After this is done you can use VMODE to set the display to graphic modes 37 and 38 listed above.

72Hz Modes

The following modes can be displayed after setting the vertical refresh rate to 72Hz. The 72Hz mode will provide a clearer display with less flicker on some monitors. Select the **VMODE 72Hz** command. After this is done you can use VMODE to set the display to any of the graphic modes listed below. Change back to standard display rates with the **VMODE 60Hz** command.

VMODE Option	Modes	Horiz. Freq.	Vert. Freq.	Resolution
72Hz	11	38.70kHz	72.70Hz	640x480
72Hz	12	38.70kHz	72.70Hz	640x480
72Hz	25	38.70kHz	72.70Hz	640x480
72Hz	29	48.40kHz	72.70Hz	800x600
72Hz	2A	48.40kHz	72.70Hz	800x600
72Hz	2E	38.70kHz	72.70Hz	640x480
72Hz	30	48.70kHz	72.70Hz	640x480

VMODE VON or VOFF

Enables/disables composite video output

VMODE UON or UOFF

Enables/disables underscan video

This mode forces video output to fit within the horizontal displayable area of the video screen. It also shrinks the VGA display output in the horizontal dimension.

VMODE FON or FOFF

Enables/disables flicker filter

The patented flicker filter reduces flickering of horizontal lines and text on the screen. Text characters may appear slightly blurred when the filter is ON. Low resolution text and graphics modes do not improve significantly when the flicker filter is enabled. When the flicker filter is

OFF, text characters may be clear, but horizontal lines on the screen will flicker.

VMODE FNORM or FLOW

Toggles between normal and reduced effect of the patented flicker filter.

VVASEL 0-11 HEX

Selects which one of twelve VGA Video Arrays is the current active board, based on the configuration of JP-3.

3.3.2 VVAVESA.COM TSR

VVAVESA VGA Video Array Super VGA BIOS Extension TSR

VVAVESA.COM is a superset of the TLIVESA.COM version of the Tseng Labs VESA Super VGA BIOS Extension driver. It was specially written to run with the InSync Technologies VGA Video Array. In addition to supporting the standard TSENG LABS BIOS and VESA version 1.2, the BIOS extensions in this driver allow control of the special multi-board modes of the VVArray. It is located on the Utility Disk in the VESA subdirectory.

To load, type the command:

VVAVESA [ENTER]

at the DOS prompt. VVAVESA may be loaded through a batch file for convenience. After loading the driver, any VESA application can be run.

The program can also be unloaded, freeing up memory, provided no other resident program which intercepts the video BIOS interrupt vector is loaded afterward. Actually, no resident program at all should be loaded afterward in order to really free the memory.

If VVAVESA was the last TSR loaded, you can unload it by typing the command:

VVAVESA U <ENTER>

VVAVESA may also be unloaded through a batch file.

The BIOS extensions specific to the VVAVESA TSR allow the initialization of the VVArray boards, switching active boards and control of shadow modes. For a detailed discussion of these BIOS calls, please refer to **Appendix C: Video BIOS Extensions, HiColor BIOS Extensions**.

3.3.3 FASTBIOS.SYS

FASTBIOS.SYS is used to transfer the contents of the VGA Video Array video ROM BIOS to PC system RAM. This utility enhances video BIOS operation speed considerably when used in older 80286- and 80386-based systems. FASTBIOS.SYS must be installed as the FIRST device in the CONFIG.SYS file.

Important: Most current-generation 386 or above systems have BIOS shadowed through EMM drivers or the system BIOS itself and do not require the use of FASTBIOS.SYS.

Install FASTBIOS.SYS in the system CONFIG.SYS file with the line:

DEVICE=FASTBIOS.SYS

This must be the FIRST such device driver listed within the CONFIG.SYS file. If this is not done, the following message may result upon loading:

FASTBIOS NOT INSTALLED

If so, another (earlier installed) device driver has taken over the video interrupt; make sure the line, DEVICE=FASTBIOS.SYS, occurs first in your CONFIG.SYS file.

Should an attempt be made to install FASTBIOS.SYS in anything less than an 80286- or 80386-based system (FASTBIOS will also work with 80486-based systems), the following message will result:

FASTBIOS requires an 80286 or 80386 machine

When FASTBIOS.SYS is successfully installed the following message appears:

FASTBIOS Installed

FASTBIOS.SYS, residing within CONFIG.SYS, can only be installed during system boot-up. Remember to reboot your system after adding FASTBIOS to your CONFIG.SYS file and ensuring that FASTBIOS.SYS exists in the same directory as CONFIG.SYS.

3.3.4 EANSI.SYS

EANSI.SYS replaces the ANSI.SYS device driver supplied on your DOS system disk. EANSI.SYS is compatible with the standard ANSI.SYS, and additionally supports the extended screen modes supported by the VGA Video Array board.

The following command must appear in the configuration file (CONFIG.SYS) to install EANSI.SYS, just as the command to install the ANSI.SYS device driver that comes on the DOS diskette would appear.

DEVICE=EANSI.SYS

Once installed with the above command, EANSI.SYS provides all the screen control and keyboard re-mapping features of ANSI.SYS (see your DOS Technical Reference manual). EANSI.SYS is a replacement for ANSI.SYS, and the two should not be in use at the same time.

Additionally, EANSI.SYS may be used to select the extended VGA Video Array screen modes. This is accomplished by issuing an escape sequence with the "set mode" command, just as any standard mode would be selected with the normal ANSI.SYS. For example, screen mode 22 hex would be selected by sending the escape sequence:

(Esc)[=34h

to the screen. (Note that 34 is the decimal equivalent of 22 hexadecimal.) To select other modes, simply replace 34 with the number of the mode you wish to select.

The available extended screen modes using an enhanced color display are as follows:

Mode	Columns	Rows
34 decimal (22 hex)	132	44
35 decimal (23 hex)	132	25
36 decimal (24 hex)	132	28
42 decimal (2A hex)	100	40
38 decimal (26 hex)	80	60
2 decimal (02 hex)	80	25

For example, to place the screen in 132-column by 44-row mode, do the following:

Place the DEVICE command `DEVICE=EANSI.SYS` in the `CONFIG.SYS` file on a bootable disk, and place `EANSI.SYS` and `QBASIC.COM` on that disk.

Boot the system, and in response to the DOS prompt, type `QBASIC`, then press `ENTER` and type the following BASIC commands:

```
OPEN "temp.dat" FOR OUTPUT AS #1
PRINT #1, CHR$(27); "[=34h";
CLOSE
SYSTEM
```

This creates the file `TEMP.DAT` containing the escape sequence to select mode 22 hex, 132-column mode. In response to the DOS prompt, type:

```
TYPE TEMP.DAT
```

then press `ENTER` which sends the escape sequence to the screen. The screen is immediately set to 132-column mode. Note that the escape sequence is not displayed; it is interpreted as a command rather than displayable text.

SECTION 4: TROUBLESHOOTING

4.1 In Case of Difficulty

General Troubleshooting:

If you have problems with booting or the display after installation, check the following to help determine the cause:

1. Ensure that all cables are properly connected and firmly seated.
2. Ensure that the display monitor is properly connected and that its power is turned on.
3. Verify that the display monitor is capable of synchronizing at the video rates you are trying to use.
4. Verify that you have enough memory to display the selected mode.
5. Check all of the cables and connectors again.

Power OFF the computer system and all other connected devices before checking the following:

6. Ensure that the jumpers on the VGA Video Array board are set properly and that the board is fully seated in the **16-bit** expansion slot.
7. Ensure that the system's motherboard switches and jumper(s) are set properly for use with the VGA Video Array board.
8. Ensure that no other switch settings on the motherboard have been accidentally changed. Refer to the documentation provided with your computer to determine the correct switch settings.

If checking these items does not locate the problem (especially if the problem involves improperly displayed characters), you can:

9. Turn off SW1-1, thereby selecting the 8-bit BIOS ROM configuration. Do a hardware reset (CTRL-ALT-DEL will not work) and recheck your system.
10. After trying step 9 above, turn off SW1-2, thereby selecting the 8-bit display memory default configuration. Do a hardware reset (CTRL-ALT-DEL will not work) and recheck your system.
11. If an HGA/MDA card is installed, try removing it.

-
12. If the system has two speeds try the slower of them.
 13. If the motherboard bus clock is adjustable try slowing it down. Though the VVA is tested at a motherboard bus clock speed of 10MHz, we recommend conforming with the E-ISA standard of 8.33MHz.

If checking these items does not locate the problem, there may be a malfunction of the computer system, display monitor or the VGA Video Array board. Consult your computer dealer for assistance in locating the problem.

Some Specific Troubleshooting Tips:

If the VGA Video Array will not sync in 800x600 or 1024x768 modes:

Make sure that the monitor is compatible with the current scan rates set on the VGA Video Array (either the default or that selected via VMODE).

If the VGA Video Array is not producing any television output:

Make sure that the power-up default switch (SW1-4) is set to ON to enable video at power-up. If your system is configured for the power-up video default OFF, you can enable video from the command line via VMODE VON (make sure VMODE is in your path).

Alternately, it is possible that the current video mode is not compatible with the generation of television output. For NTSC video the maximum resolution is 640x480 graphics and 720x400 text. For PAL video the maximum resolution is 800x600 graphics and 720x400 text.

If the television Flicker Filter is not working:

Make sure that the power-up default switch (SW1-3) is set to ON to enable the Flicker Filter at power-up. If your system is configured to power up with the Flicker Filter OFF, you can enable it via VMODE FON.

If the VGA screen is compressed vertically in EGA resolutions:

This is because the VGA video must be set to 480 line mode when the VGA is generating television video, regardless of whether the VGA mode is set at 480 lines. For example, when the VGA is set to mode 10 (640x350x16 colors) and the television video output is enabled, the 350 lines will be displayed in a field of 480 lines.

Other alternatives are to use a standard VGA mode such as 640x480x16 colors (mode 12), or to disable the video output with VMODE VOFF, and rerun the application software.

If the VGA screen rolls or wraps around vertically (ghosting and diagonal lines on lower half of screen) when video output is enabled (PAL version only):

The PAL VGA Video Array operates at 50Hz vertically while producing television video output. It is therefore essential that the VGA monitor is capable of operation at 50Hz.

If the VGA screen changes size when enabling and disabling PAL television video output (PAL version only):

Some VGA monitors will require the vertical size to be adjusted between 50Hz operation and 60Hz operation. If the monitor is adjusted for 50Hz and the VGA Video Array is switched to 60Hz/70Hz operation then the 60Hz/70Hz image will be compressed vertically. See Appendix B, PAL Considerations.

If the VGA screen flickers (PAL version only):

The PAL VGA Video Array operates at 50Hz vertically while producing television output. Operating at this sync rate causes the VGA screen to flicker more than normally. Turning off the PAL television video output will force the VGA Video Array to generate standard VGA video at 60Hz/70Hz. The VGA Video Array can be set to power-up with the PAL television output either on or off. The PAL television output can also be turned on and off using VMODE from the command line. VMODE VOFF will turn off television video output. VMODE VON will turn the television video output back on if the current VGA mode is compatible with television video output.

If the screen does not scroll properly when using an extended screen mode (like 0x22,24,26...):

Make sure that EANSI.SYS has been loaded. EANSI.SYS is required for extended text modes.

4.2 How to Get Help

Please contact your dealer or system provider with any technical questions you have. Your place of purchase is the first resource for resolving applications or troubleshooting issues.

Secondarily, technical assistance is available from InSync Technologies, Inc. Please gather the following information before placing your call:

- ☐ Description of the problem
- ☐ Place and date of purchase
- ☐ Serial number of the VGA Video Array board (no warranty service or returns authorized without serial number)
- ☐ System information including brand name, make and model of your computer, monitor, cabling, hard disk and any peripherals
- ☐ Memory configurations of host computer and VVArrays
- ☐ Jumper and switch settings of each VVArray in the system
- ☐ Operating system name and version
- ☐ System BIOS name, date and version # (displayed at power-up, also available through VDIAG)
- ☐ Contents of your CONFIG.SYS file
- ☐ Contents of your AUTOEXEC.BAT file
- ☐ Any other facts relevant to the problem

InSync Technologies, Inc. can be reached by mail at 14439 Catalina Street, San Leandro California 94577, or by calling (510)895-6800, FAX (510)895-6899.

4.3 Returning Your Board for Repair

Please contact your dealer or system provider for instructions regarding returning your board for repair. In general you will need to include the following information with your board:

- ☐ A description of the problem and what occurred prior to the board malfunctioning.
- ☐ The serial numbers of all VGA Video Array boards in the system (no warranty service or returns authorized without serial numbers)
- ☐ Places and dates of purchase
- ☐ System information including brand name, make and model of your computer, monitor, hard disk and any peripherals
- ☐ Memory configurations of host computer and VVArrays
- ☐ Operating system name and version
- ☐ System BIOS name, date and version # (displayed at power-up, also available through VDIAG)
- ☐ Contents of your CONFIG.SYS file
- ☐ Contents of your AUTOEXEC.BAT file
- ☐ Any other facts relevant to the problem

Boards should be packaged properly in anti-static packing and shipped in accordance with instructions received from your point of purchase.

APPENDIX A:

Connector Information

IMPORTANT

The VGA Video Array board uses the same 15-pin (DB15) cable available from monitor manufacturers to interface with the IBM PS/2 computers. Using an incorrect cable may result in damage to the monitor and/or adapter.

P2 - S-Video/RGB/Composite Video Display Connector (DB9-S)

P2 Signal Description	Pin
Ground	1
Ground	2
Red Out	3
Green Out	4
Blue Out	5
NTSC/PAL Video Out	6
CSYNC Out or GLSYNC In	7
S-VID Y or H-SYNC Out	8
S-VID C or V-SYNC Out	9

P3 is an RCA Female connector carrying the Composite Video output or Gen-Lock sync in (see JP101).

P4 - Direct Drive Video Display Connector (DB15-S)

P4 Signal Description	Pin
Red	1
Green	2
Blue	3
Monitor ID bit 2	4
Not used	5
Ground	6
Ground	7
Ground	8
Not used	9
Ground	10
Monitor ID bit 0	11
Monitor ID bit 1	12
Horizontal Sync	13
Vertical Sync	14
Not used	15

APPENDIX B:

PAL Video Considerations

PAL television differs from NTSC television encoding in its basic screen format and vertical refresh rate. Therefore, standard VGA which operates at twice the NTSC refresh rate does not scale as neatly to the PAL refresh rate. This appendix first addresses how enabling PAL television output affects VGA video output, and then discusses use of the 800 x 600 resolution mode with PAL output.

VGA Video Output with Simultaneous PAL Television Output

PAL television operates at a vertical refresh rate of 50Hz per field, resulting in a 25Hz interlaced frame rate. Standard VGA operates at a 60 Hertz non-interlaced frame rate. To be compatible with the 50Hz rate, the VGA Video Array's VGA output is switched from 60Hz to 50Hz when PAL television output is enabled. When PAL output is disabled by power up default switches, by a BIOS call or by the VMODE VOFF command, the VGA Video Array resumes normal 60Hz VGA output and blanks the PAL output.

Though most VGA monitors will synchronize to a 50Hz vertical refresh rate, not all do so. We strongly recommend testing a particular monitor with the VGA Video Array before purchasing in large quantities. Please contact us if you have specific concerns on this point.

When PAL output is enabled and the VGA is running at 50Hz, two effects may be observed on the VGA monitor. These are increased flicker and loss of image information at the top and bottom edges. If the flicker poses a significant problem, PAL television output should be disabled when not in use. It is also possible, but expensive, to buy a monitor with long persistence phosphor which will be much less prone to flicker.

Loss of image information, which can be compensated for by adjusting the vertical size control, is due to the scan length difference between normal VGA format (480 lines) and PAL format (576 lines). Once the vertical size on the VGA monitor has been adjusted to display with PAL television output enabled, there will be a vertical compression of the image when PAL output is disabled. If this vertical compression, which is generally an aesthetic problem only, is unacceptable in a given application, there are several manufacturers who build monitors which allow individual adjustment of each video mode's position and size, and will automatically switch between settings when the video mode changes.

800 x 600 Resolution Mode with PAL Television Output

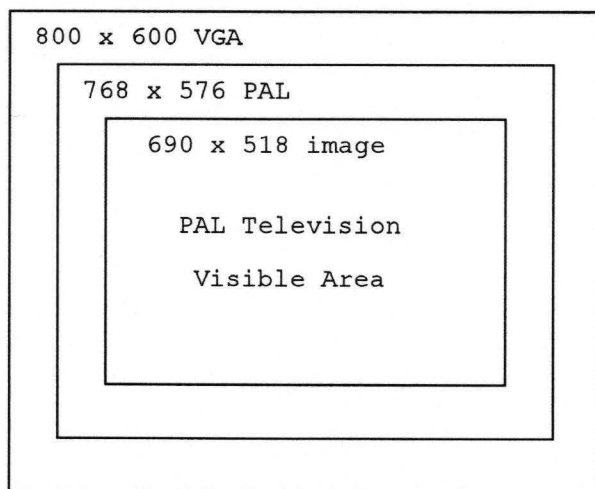
800 pixel x 600 line resolution is supported as an extended resolution mode by VESA and by VGA designs based on the Tseng Labs ET4000 VGA controller, including the VGA Video Array. This resolution is enabled by a Mode 30H BIOS call. When a VGA Video Array has PAL television output enabled, its 800 x 600 refresh timing is modified to force the active area of the PAL output to be 768 pixels x 576 lines. This provides a high level of compatibility between PAL television output and

existing software drivers and applications. The VGA output timing is maintained so that the VGA section will continue to display 800 pixels x 600 lines.

To the user, this resolution mode appears identical to the standard 800 x 600 mode, except that the first and last 16 pixels of the 800 pixel dimension and the first and last 12 lines of the 600 line dimension are blanked on the PAL television output. This blanking feature should be taken into account by the software designer.

Mode 30_H at 768 x 576 resolution will cause overscan on a PAL television monitor, in that the unblanked image will extend off the edge of the visible screen by approximately 5% even though the entire image is visible on the VGA monitor. Television video is designed to overscan so the viewer will never see a distracting edge to a televised image. As a television ages, its display area may drift horizontally, vertically, or in size. Overscan prevents the viewer from detecting this drift if it is less than 5%. Professional PAL monitors often have a switch-selectable underscan feature to allow viewing the overscan area for quality control, but since with the VGA Video Array the whole image is visible on the VGA monitor, the VGA image can be used for this purpose. Although overscan is required for TV production, if an application requires having the entire image visible on the PAL television display then 640 x 480 resolution, Mode 2E_H, should be used with underscan enabled.

The figure below illustrates 800 x 600 resolution at the PAL television output.



Software Interface for PAL Television Output in Mode 30_H

- All lines are 800 pixels long with 16 of these pixels blanked at the beginning and end of each line of the PAL output.
- There are 600 lines in an image with the first and last 12 of these lines blanked in the PAL output.

-
- In 256 color mode, each pixel occupies one (1) byte. In 32,768 and 65,536 color modes, each pixel occupies two (2) bytes.
 - The active area of PAL television output is 768 pixels by 576 lines, while the area visible on the television screen is approximately 690 pixels by 518 lines due to overscan.
 - Text is supported only in 256 color mode, in which a character cell is 8 pixels x 16 lines.

APPENDIX C: DISPLAY MODES

The VGA display output will switch to 31.468kHz horizontal and 59.94Hz vertical when NTSC video is enabled, regardless of the horizontal and vertical VGA rates while video is disabled. The same VGA modes will run at 31.25kHz and 50.00Hz when PAL video is enabled, again regardless of the rates while video is disabled.

The 800x600 mode 30 will display at 768x576 on a PAL video monitor when video is enabled, as discussed in Appendix B. The VGA data stream will still contain full 800x600 information. As noted in the table below, running in this mode with PAL video enabled requires 1Mb of display memory.

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Box Size
0	A/N	16/256k	40x25	B8000	9x16
1	A/N	16/256k	40x25	B8000	8x8
2	A/N	16/256k	80x25	B8000	8x8
3	A/N	16/256k	80x25	B8000	8x8
4	APA	4/256k	40x25	B8000	8x8
5	APA	4/256k	40x25	B8000	8x8
6	APA	2/256k	80x25	B8000	8x8
7	A/N	Mono	80x25	B0000	9x14
D	APA	16/256k	40x25	A0000	8x8
E	APA	16/256k	80x25	A0000	8x8
F	APA	Mono	80x25	A0000	8x14
10	APA	16/256k	80x25	A0000	8x14
11	APA	2/256k	80x30	A0000	8x16
11,72H	APA	2/256k	80x30	A0000	8x16
12	APA	16/256k	80x30	A0000	8x16
12,72H	APA	16/256k	80x30	A0000	8x16
13	APA	256/256k	40x25	A0000	8x8

Max Pg.	Display Size	VGA Hor. Freq.(Khz)	VGA Vert. Freq.(Hz)	Video Out: PAL/NTSC
8	360x400	31.50	70.00	Both
8	320x200	31.50	70.00	Both
8	640x200	31.50	70.00	Both
8	640x200	31.50	70.00	Both
1	320x200	31.50	70.00	Both
1	320x200	31.50	70.00	Both
1	640x200	31.50	70.00	Both
8	720x350	31.50	70.00	Both
8	320x200	31.50	70.00	Both
4	640x200	31.50	70.00	Both
2	640x350	31.50	70.00	Both
2	640x350	31.50	70.00	Both
1	640x480	31.50	60.00	Both
1	640x480	38.70	72.70	Neither
1	640x480	31.50	60.00	Both
1	640x480	38.70	72.70	Neither
1	320x200	31.50	70.00	Both

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Box Size
21	A/N	16/256k	132x60	B8000	8x8
22	A/N	16/256k	132x44	B8000	8x9
23	A/N	16/256k	132x25	B8000	8x16
24	A/N	16/256k	132x28	B8000	8x14
25	APA	16/256k	80x60	A0000	8x8
25, 72H	APA	16/256k	80x60	A0000	8x8
26	A/N	16/256k	80x60	B8000	9x8
29, 35k	APA	16/256k	100x37	A0000	8x16
29, 38k	APA	16/256k	100x37	A0000	8x16
29, 48k	APA	16/256k	100x37	A0000	8x16
2A, 35k	A/N	16/256k	100x40	B8000	8x15
2A, 38k	A/N	16/256k	100x40	B8000	8x15
2A, 48k	A/N	16/256k	100x40	B8000	8x15
2D, PAL	APA	256/256k	80x25	A0000	8x14
2D, NTSC	APA	256/256k	80x25	A0000	8x14
2E	APA	256/256k	80x30	A0000	8x16
2E, 72H	APA	256/256k	80x30	A0000	8x16

Max Pg.	Display Size	VGA Hor. Freq.(Khz)	VGA Vert. Freq.(Hz)	Video Out: PAL/NTSC
2	1056x480	30.50	60.00	Neither
2	1056x396	30.50	70.00	Neither
4	1056x400	30.50	70.00	Neither
4	1056x392	30.50	70.00	Neither
1	640x480	31.50	60.00	Both
1	640x480	38.70	72.70	Neither
2	720x480	31.50	60.00	Both
1	800x600	35.50	56.00	Neither
1	800x600	38.00	60.00	Neither
1	800x600	48.40	72.70	Neither
4	800x600	35.50	56.00	Neither
4	800x600	38.00	60.00	Neither
4	800x600	48.40	72.70	Neither
1	512x576	31.50	56.00	PAL
1	512x480	31.50	60.00	NTSC
1	640x480	31.50	60.00	Both
1	640x480	38.70	72.70	Neither

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Box Size
2F	APA	256/256k	80x25	A0000	8x16
30, 35k	APA	256/256k	100x37	A0000	8x16
30, 38k	APA	256/256k	100x37	A0000	8x16
30, 48k	APA	256/256k	100x37	A0000	8x16
37i	APA	16/256k	128x48	A0000	8x16
37n	APA	16/256k	128x48	A0000	8x16
38i*	APA	256/256k	128x48	A0000	8x16
38n*	APA	256/256k	128x48	A0000	8x16
3Di*	APA	16/256k	160x64	A0000	8x16

A/N Alphanumeric modes (text)

APA All Points Addressable modes (graphics)

* Mode requires 1Mb display memory

i Interlaced modes

n Non-Interlaced modes

Max Pg.	Display Size	VGA Hor. Freq.(Khz)	VGA Vert. Freq.(Hz)	Video Out: PAL/NTSC
1	640x400	31.50	70.00	Both
1	800x600	35.50	56.00	PAL
1	800x600	38.00	60.00	PAL
1	800x600	48.40	72.70	PAL
1	1024x768	35.50	87.00	Neither
1	1024x768	49.00	60.50	Neither
1	1024x768	35.50	87.00	Neither
1	1024x768	49.00	60.50	Neither
1	1280x1024	48.10	87.00	Neither

Hi-Color Modes:

See BIOS calls, **Appendix D**, for details on enabling these modes.

All Hi-Color modes require 1Mb of display memory.

Mode	Type	Colors/ Shades	Alpha Format	Buffer Start	Box Size
13	APA	32k/65k	40x25	A0000	8x8
2D, PAL	APA	32k/65k	80x25	A0000	8x14
2D, NTSC	APA	32k/65k	80x25	A0000	8x14
2E	APA	32k/65k	80x30	A0000	8x16
2E, 72H	APA	32k/65k	80x30	A0000	8x16
2F	APA	32k/65k	80x25	A0000	8x16
30i	APA	32k/65k	100x37	A0000	8x16

A/N Alphanumeric modes (text)

APA All Points Addressable modes (graphics)

i Interlaced modes

Max Pg.	Display Size	VGA Hor. Freq.(Khz)	VGA Vert. Freq.(Hz)	Video Out: PAL/NTSC
1	320x200	31.50	70.00	Both
1	512x576	31.50	56.00	Both
1	512x480	31.50	60.00	Both
1	640x480	31.50	60.00	Both
1	640x480	38.70	72.70	Neither
1	640x400	31.50	70.00	Both
1	800x600	31.60	91.70	PAL

APPENDIX D: VIDEO BIOS EXTENSIONS

The VGA Video Array's BIOS provides several extensions to the standard S-VGA Video BIOS calls (software interrupt 10h). These extensions are separated into two groups. The first set of extensions are built directly into the VGA Video Array's BIOS and are always available. The second set of extensions are implemented in the TSR VVAVESA.

All VGA Video Array extended BIOS functions are called with INT 10h, AX=7000h, and BX=(subfunction #). Every function returns status information in the AX register. The format of the extended BIOS Function Status Return is as follows:

AL = 70h Function Supported
AL != 70h Function NOT Supported(!= for "not-equal to")
AH = 00h Function Call Successful
AH != 00h Function Call NOT Successful

The built-in BIOS extensions are:

INT 10h

AX = 7000h

BX = 0000h Return ID of VGA Video Array board.

Entry: None.

Exit: AX = Extended BIOS Function Status.

CX = BBBXh where:

BBB = board number ID, 700 for VVARRAY

X = board version and REV.

b0 = PAL/NTSC (1/0)

b1-3 = Revision number

BX = 3000h Return state of NTSC/PAL output.

Entry: None.

Exit: AX = Extended BIOS Function Status.

CX = General board information:

- b0 = NTSC/PAL output off/on (1/0)
- b1 = Flicker Filter on/off (1/0)
- b2 = Underscan on/off (1/0)
- b3 = Reserved
- b4 = Reserved
- b5 = 8-bit Flicker Filter lower/normal (1/0)
- b6 = Reserved
- b7 = Reserved
- b8-
b11 = Currently selected board.
- b12 = Reserved
- b13 = Reserved
- b14 = Reserved
- b15 = Video Field Odd/Even (1/0)

BX = 3001h Set State of NTSC/PAL Output.

Entry: CH = 00h to disable feature
01h to enable feature

CL = 01h to enable/disable NTSC/PAL output *
02h to enable/disable Flicker Filter
03h to enable/disable Underscan *

06h for lower/normal 8-bit Flicker Filter (1/0)

2Dh to enable/disable Double Line mode.

Exit: AX = Extended BIOS Function Status.

- * These functions take effect ONLY after the next Set Video Mode: INT 10, AH=00, AL=mode to set.

BX = 3002h Switch active VGA board and DO NOT save/restore VGA state or BIOS data area.

WARNING: This call should only be used if the application code wants complete control over the VGA boards and will reset the DOS environment through a set mode before exiting to DOS. If this will not be the case, load VVAVESA and use BIOS call bx = 3011h (see below).

Entry: CL = VVA to make active (0-bh)

Exit: AX = Extended BIOS Function Status. A status return of unsuccessful means the board is not installed.

AX = 10F0h Set HiColor mode.

This call will attempt to set a 16-bit/pixel (HiColor) mode with the same X and Y dimensions as the specified 256-color mode. The call will fail if there is not a HiColor DAC present, if the specified mode is invalid, or if there are memory or other hardware limitations. Note: This mode defaults to 5/5/5 format.

Entry: BL = Mode number: Set 16-bit/pixel mode; valid (256 color) mode numbers are: 13; 2D; 2E; 2F; and 30. Set bit 7 of mode number to 1 to not clear memory (93, AD, AE, AF, or B0).

BH = Don't care.

Exit: AL = 10

AH = 0 if successful
!= 0 if failed (not equal to 0)

AX = 10F1h Get DAC type.

Entry: None

Exit: AL = 10

 AH = 0

 BL = 0 if normal DAC
 != 0 if HiColor DAC

AX = 10F2h Get/Set HiColor format.

NOTE: The board must be in 16-bit/pixel HiColor mode in order to set format.

Entry: BL = Code for HiColor format
 0 = Get format
 1 = Set format (5/5/5)
 2 = Set format (5/6/5)

Exit: AL = 10

 AH = 0 if successful
 != 0 if failed

 BL = 0 if was not in HiColor mode
 1 if now in format (5/5/5)*
 2 if now in format (5/6/5)*

* Bit allocations for these formats are as follows:

(5/5/5)	Bit 15Reserved	
	<14:10>	Red
	<9:5>	Green
	<4:0>	Blue
(5/6/5)	<15:11>	Red
	<10:5>	Green
	<4:0>	Blue

Once VVAVESA has been loaded as described in Section 2.7 above, the following extension calls may be used:

INT 10h

AX = 7000h

BX = 3010h Initialize All VGA Boards

Initialize all VGA boards in the system by doing a Set Video Mode and Save BIOS Data Area. The standard VGA BIOS call Save BIOS Data Area (AH=1Ch) is used with storage allocated in the TSR VVAVESA.

Exit: AX = Extended BIOS Function Status.

CX = Binary indication of boards installed that were initialized:

b0 = Board 0 installed/not (1/0)

b1 = Board 1 installed/not (1/0)

b2 = Board 2 installed/not (1/0)

.
.
.

b11 = Board 11 installed/not (1/0)

b12-15 are Reserved.

BX = 3011h Switch Active VGA Board

Switches the active VGA board while saving the current VGA board's BIOS data area and restoring the BIOS data area of the newly active board. This function will not operate until the VGA boards are initialized using the BX=3010h Initialize All VGA Boards BIOS call. If the board has not been installed an unsuccessful status is returned and the previously active board remains so.

Entry: CL = Number of board (0-11 decimal) to make active.

Exit: AX = Extended BIOS Function Status.

BX = 3012h Enable/Disable SHADOW Mode for VGA Board

Controls the SHADOW Mode operation including the boards which will shadow other boards, the boards to be shadowed, and turning shadowing on and off on individual boards .

Entry: CL = Number of board (0-11 decimal) on which to ENABLE/DISABLE SHADOW Mode.

CH = Number of board (0-11 decimal) to be shadowed by shadowing board (CL value). Naming a shadowed board ENABLES shadowing. If set to FFh DISABLES shadowing by board indicated by value in CL.

Exit: AX = Extended BIOS Function Status.

Note: SHADOW mode has several implications. The VGA registers, palette registers, and the VGA memory all read and write together. This could give erroneous results on reads as well as make some BIOS calls malfunction. The following are some guidelines which, if followed, will make SHADOW mode operate properly under all conditions:

Set the SAME video GRAPHICS mode for all shadowing VGAs before enabling SHADOW mode. Do not use BIOS to scroll text since scrolling is done by read-modify-writes. Since each VGA has its own vertical timing (unless the Synchronizer Daughter Card is installed) the VGA status register one (1) will give erroneous results regarding vertical retrace. This means that software which uses the vertical retrace to synchronize will malfunction. This includes software which tries to do palette writes synchronized to vertical retrace.

BX = 3013h Return Boards Initialized Flags.

Entry: None

Exit: AX = Extended BIOS Function Status.

CX = Indicates which of the installed boards have been initialized. If CX = 0 then the BX = 3010h BIOS call to initialize all boards has not been made.
Otherwise:

b0 = Board 0 initialized/not (1/0)

b1 = Board 1 initialized/not (1/0)

b2 = Board 2 initialized/not (1/0)

.

b11 = Board 11 initialized/not (1/0)

b12-15 are Reserved.

APPENDIX E: TARGA COMPATIBILITY

The VGA Video Array supports a Targa Compatible resolution mode (2D hex) of 512x480 with 32,768 colors. This will allow OEMs using Targa format images to load them without horizontal scale distortions and without having to recalculate them into a 640 wide format.

The VGA Video Array also supports 256 and 65,536 colors at 512x480 resolution to allow for reduced and enhanced color applications.

Another advantage to the 512x480 resolution is that the number of image buffers is doubled compared to the corresponding number of buffers when using 640x480 modes. This expansion takes place because a 512x480 image with 32,768 or 65,536 colors (16 bits) takes up less than 0.5Mb of memory, while a 640x480 image displayed with the same colors takes well over 0.5Mb, essentially using up 1.0Mb. The same 512x480 image with 256 colors (8 bits) takes up less than 0.25Mb.

These memory savings in the 512x480 mode allow back buffering (loading a second image into memory) with 0.5Mb for 256 color images. 1.0Mb of display memory allows back buffering of 32,768 or 65,536 color images.

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